

Yearly Burden of Skin Cancer in Non-Caucasian and Caucasian Solid-organ Transplant Recipients

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ABSTRACT

Objective: To examine the skin cancer tumor accrual rates in non-Caucasian and Caucasian post-transplant recipients. **Design/Setting/Participants:** Retrospective chart review of solid-organ transplant patients who presented to the outpatient dermatology clinic at the University of Chicago and have had at least one skin biopsy to rule in/out skin cancer in the 10-year period from January 1, 2003, to December 31, 2012. One hundred fifty-two solid-organ transplant recipients were identified through a natural language search in CoPathPlus. **Measurements:** Each transplant patient's skin cancer accrual rates, defined as the number of skin cancers per person per year, were examined. The average accrual rates for non-Caucasians and Caucasians were compared and analyzed. **Results:** Of the 152 post-transplant patients identified, 58 were non-Caucasian and 94 were Caucasian. Eight (13.8%) non-Caucasians developed skin cancer, compared to 61 (64.9%) Caucasians ($P < 0.001$). Non-Caucasian post-transplant patients had lower skin cancer accrual rates with an overall skin cancer accrual rate of 0.13, squamous cell carcinoma accrual rate of 0.10, and basal cell carcinoma accrual rate of 0.01 versus 1.13 ($P < 0.001$), 0.96 ($P < 0.001$), and 0.15 ($P < 0.001$), respectively, for Caucasian patients. Comparison of post-transplant non-Caucasian and Caucasian patients who developed skin cancer revealed lower overall (0.96 vs. 1.74; $P = 0.25$), squamous cell carcinoma (0.75 vs. 1.49; $P = 0.16$), and basal cell carcinoma (0.06 vs. 0.24; $P = 0.13$) accrual rates in non-Caucasians. **Conclusion:** The authors' findings highlight the importance of annual total body skin exams for post-transplant patients and the need to identify and further educate those transplant patients with a higher risk for skin cancer development. (*J Clin Aesthet Dermatol.* 2015;8(3):16–19.)

Skin cancer is the most common malignancy in organ transplant recipients, with squamous cell carcinoma (SCC) and basal cell carcinoma (BCC) accounting for more than 90 percent of the post-transplant skin cancer diagnoses.^{1,2} Compared to the general population, solid-organ transplant recipients have a higher risk of developing skin cancer.^{1–3} In the non-transplant population, BCC is the most common skin cancer, with the ratio of BCC to SCC diagnoses at 4:1. In contrast, in the organ transplant population, this ratio is reversed, with SCCs being the predominant skin cancer.^{1,2} Multifold increases in the incidence rates of various skin cancers when compared to the normal population have been described, ranging from a 65-fold increase in SCC to a ten-fold increase in BCC.^{1–4}

In general, skin cancer is less common in the non-Caucasian population than in Caucasians. Skin cancer

accounts for 20 to 30 percent of all neoplasms in Caucasians, 2 to 4 percent in Asians, and 1 to 2 percent in African Americans and Asian Indians.⁵ Typically, the rates of skin cancer in non-Caucasian post-transplant patients are lower than the rates in Caucasian post-transplant recipients. Japanese studies have found that only around 2.5 percent of the malignancies in Japanese post-renal transplant patients were skin cancers.^{6,7} A Taiwanese study found no incidence of SCCs or BCCs post-renal transplant.⁸ Similar to these observations, South African studies showed no cases of nonmelanoma skin cancer in non-Caucasians.^{9,10} A recent American study found greater nonmelanoma skin cancer occurrences in renal transplants with skin types I to III than in types IV to VI.¹¹ Likewise, a Switzerland study found a higher incidence of SCCs in light-skinned renal transplant patients compared to darker skinned transplant patients.¹²

DISCLOSURE: The authors report no relevant conflicts of interest.

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TABLE 1. Skin cancer accrual rates in transplant patients

	NON-CAUCASIAN (n=58)		CAUCASIAN (n=94)		
	MEAN ACCRUAL RATE \pm SD	MEDIAN (RANGE)	MEAN ACCRUAL RATE \pm SD	MEDIAN (RANGE)	P-VALUE*
All skin cancer	0.13 \pm 0.63	0.00 (0.00-4.67)	1.13 \pm 2.27	0.25 (0.00-15.25)	<0.001
SCC	0.10 \pm 0.62	0.00 (0.00-4.67)	0.96 \pm 2.17	0.11 (0.00-14.50)	<0.001
BCC	0.01 \pm 0.07	0.00 (0.00-0.50)	0.15 \pm 0.34	0.00 (0.00-2.00)	<0.001

*Calculated by Mann-Whitney test

The primary goal of this study was to examine the distribution of biopsy-confirmed skin cancer diagnoses in Caucasian and non-Caucasian post-transplant recipients and compare the skin cancer tumor accrual rates (number of tumors per person per year) of non-Caucasian solid-organ transplant recipients to those of Caucasian solid-organ transplant recipients.

METHODS

This study was conducted through a retrospective chart review. Solid-organ transplant recipients who presented to the outpatient dermatology clinic at the University of Chicago and have had at least one skin biopsy to rule in/out skin cancer in the 10-year period from January 1, 2003, to December 31, 2012, were included in this study. Skin biopsies of solid-organ transplant patients were identified through a natural language search in CoPathPlus, an application used for reporting of pathology results. The search was limited to those specimens procured in the dermatology clinic between January 1, 2003, and December 31, 2012, and the search criteria used were “transplant,” “transplants,” or “tx” as documented in the clinical history. Utilizing the eligible subjects from the CoPathPlus search, further information was obtained from Epic and MRView. This study was approved by the University of Chicago institutional review board.

To calculate the overall skin cancer, SCC, and BCC accrual rates for each patient, the number of all skin cancers, SCCs, and BCCs manifested respectively post-transplant during the 10-year period were added up separately and divided by the number of years seen in the dermatology clinic post-transplant during the 10-year period. The mean accrual rates of the groups studied were calculated by summing the accrual rates for each patient in the group and dividing by the total number of patients in the group.

Qualitative variables were compared using the chi-square test, and quantitative variables were compared using the

Mann-Whitney test. The statistical analyses were done with Stata v.12. Differences with $P < 0.05$ were considered statistically significant.

RESULTS

A total of 152 solid-organ transplant recipients with a total of 806 skin biopsies were included in this study. Approximately 65 percent were male and 35 percent were female. Fifty-eight patients (38.16%) were non-Caucasian (35 African-Americans, 18 Hispanics, 3 Asians, and 2 others), and 94 patients (61.84%) were Caucasian. The average number of years seen in the dermatology clinic was 3.71 ± 2.90 years.

Of the 152 patients, 69 patients (45.4%) developed a total of 417 biopsy-proven skin cancers. Of the 69 patients who developed cancer, eight were non-Caucasian (with 54 biopsy-confirmed skin cancer) and 61 were Caucasian (with 363 biopsy-confirmed skin cancer). A lower proportion of non-Caucasian patients (13.8%) were diagnosed with skin cancer compared to Caucasians (64.9%; $P < 0.001$). A total of 360 SCCs were diagnosed in 55 patients, 51 SCCs in five non-Caucasians and 309 SCCs in 50 Caucasians. A total of 49 BCCs were diagnosed in 27 patients, one BCC in a non-Caucasian and 48 BCCs in 26 Caucasians. Sixteen patients developed both SCC and BCC and all were Caucasian. Five patients developed other skin cancers; two were non-Caucasians, both developing sebaceous carcinoma only. Three were Caucasians. One developed sebaceous carcinoma only; one developed trichilemmal carcinoma, SCC, and BCC; and one developed cutaneous T-cell lymphoma and SCC.

The overall accrual rate (number of skin cancers per person per year) for all types of skin cancer for the 152 people in the authors' study was 0.75 ± 1.89 . The overall SCC accrual rate was 0.64 ± 1.79 . The overall BCC accrual rate was 0.10 ± 0.28 . The accrual rate for all skin cancers in non-Caucasians was 0.13 ± 0.63 , lower than the accrual rate of

TABLE 2. Skin cancer accrual rates in transplant patients with biopsy-proven skin cancer

	NON-CAUCASIAN (n=8)		CAUCASIAN (n=61)		
	MEAN ACCRUAL RATE \pm SD	MEDIAN (RANGE)	MEAN ACCRUAL RATE \pm SD	MEDIAN (RANGE)	P-VALUE*
All skin cancer	0.96 \pm 1.52	0.42 (0.11-4.67)	1.74 \pm 2.63	1.00 (0.10-15.25)	0.25
SCC	0.75 \pm 1.60	0.18 (0.00-4.67)	1.49 \pm 2.55	0.43 (0.00-14.50)	0.16
BCC	0.06 \pm 0.18	0.00 (0.00-0.50)	0.24 \pm 0.40	0.00 (0.00-2.00)	0.13

*Calculated by Mann-Whitney test

1.13 \pm 2.27 for all skin cancers in Caucasians ($P<0.001$). The non-Caucasian SCC accrual rate was 0.10 \pm 0.62, lower than the Caucasian SCC accrual rate of 0.96 \pm 2.17 ($P<0.001$). The non-Caucasian BCC accrual rate was 0.01 \pm 0.07, lower than the Caucasian BCC accrual rate of 0.15 \pm 0.34 ($P<0.001$; Table 1).

A sub-analysis was done looking at tumor accrual rates only in the transplant recipients with biopsy-proven skin cancer. For this group of 69 patients, the overall skin cancer accrual rate was 1.65 \pm 2.53. The overall SCC accrual rate was 1.40 \pm 2.46. The overall BCC accrual rate was 0.22 \pm 0.38. Non-Caucasians had lower, but not significantly lower, skin cancer accrual rates compared to Caucasians. The non-Caucasian accrual rate for all skin cancers was 0.96 \pm 1.52, lower than the accrual rate of 1.74 \pm 2.63 in Caucasians ($P=0.25$). The non-Caucasian SCC accrual rate was 0.75 \pm 1.60, lower than the Caucasian SCC accrual rate of 1.49 \pm 2.55 ($P=0.16$). The non-Caucasian BCC accrual rate was 0.06 \pm 0.18, lower than the Caucasian BCC accrual rate of 0.24 \pm 0.40 ($P=0.13$; Table 2).

DISCUSSION

Currently, many of the studies examining skin cancers in solid-organ transplant recipients focus on Caucasian subjects. The few reports examining skin cancer in non-Caucasian transplant recipients are often conducted in fairly homogenous populations, making a direct comparison of skin cancer development in non-Caucasian and Caucasian transplant recipients more difficult. The authors found that a significantly lower percentage of non-Caucasian patients developed skin cancer, 13.8 versus 64.9 percent for Caucasians ($P<0.001$), consistent with previous studies done in ethnically diverse populations.^{10,13}

Additionally, the authors examined the skin cancer accrual rates (the number of skin cancers per person per year) in non-Caucasian and Caucasian transplant recipients. While the incidence of skin cancer is well studied, there is less data on the overall burden of skin cancers, especially in

non-Caucasian transplant recipients. In examining tumor accrual rates, the authors hoped to find an estimate of the yearly burden of skin cancer in transplant patients.

To our knowledge, there have only been two studies that have looked at skin cancer accrual rates in transplant patients, both conducted in Australia. The mean overall skin cancer accrual rate reported by Carroll et al¹⁴ was 1.85 and by Ng et al¹⁵ was 1.20. In the authors' study, the overall skin cancer accrual rate was 0.75, lower than the mean accrual rates in the aforementioned studies. Their mean SCC and BCC accrual rates were also lower, which may be attributable to environmental and demographic differences.³

The authors found the overall skin cancer, SCC, and BCC accrual rates in non-Caucasians to be significantly lower than the accrual rates in Caucasians (Table 1; $P<0.001$), consistent with previous studies demonstrating that non-Caucasians develop less skin cancer in the general population⁵ and develop less skin cancer in the transplant population.^{10,13} Lower tumor accrual rates in non-Caucasians may be attributed to development of fewer tumors overall.

A sub-analysis of the solid-organ transplant population who had biopsy-confirmed skin cancer showed that although the overall skin cancer, SCC, and BCC accrual rates in non-Caucasians with skin cancer was lower than the accrual rates in Caucasians with skin cancer, this result was not statistically significant (Table 2; $P>0.05$). This may support the possibility that while the incidence and development of the first skin cancer is significantly lower in non-Caucasian transplant patients, subsequent development of additional skin cancers may not be significantly different from that of Caucasian patients. Consequently, it remains important to educate both Caucasian and non-Caucasian solid-organ transplant patients of the risk of the development of skin cancer after organ transplantation and the benefits of screening.

Limitations of this study include the retrospective nature of the study, which prevented the collection and analysis of more detailed characteristics not present in the medical

records that would be possible in a prospective study, such as Fitzpatrick skin types, which would allow a more precise examination of accrual rates. Additionally, the authors' study looked at only those transplant patients who had undergone a skin biopsy to rule in/out skin cancer. It did not include those transplant patients who were seen in the clinic, but did not present with any malignancies that needed a biopsy, which could influence the calculation of accrual rates for the overall post-transplantation population. Lastly, the overall number of non-Caucasian subjects included in this study was small. This may highlight the significant difference in skin cancer development between non-Caucasians and Caucasians. Despite these limitations, this study provides a snapshot of the yearly burden of skin cancers in solid-organ transplant patients in a diverse patient population.

As the most common malignancy in solid-organ transplant patients, skin cancer is a concern for transplant recipients. By looking at skin cancer accrual rates in organ transplants, this study examined the yearly burden of skin cancer in these patients. Overall skin cancer, SCC, and BCC accrual rates were lower in non-Caucasians than in Caucasians. The authors' findings highlight the importance of annual total body skin exams and the need to identify and further educate those transplant patients with higher risk for skin cancer development.

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